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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/605,766	10/24/2003	Toshiharu Furukawa	BUR920030064US1	2765
23550	7590	08/31/2004	EXAMINER	
HOFFMAN WARNICK & D'ALESSANDRO, LLC			SMOOT, STEPHEN W	
3 E-COMM SQUARE			ART UNIT	PAPER NUMBER
ALBANY, NY 12207			2813	

DATE MAILED: 08/31/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/605,766	FURUKAWA ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Stephen W. Smoot	2813	<i>pr</i>

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 24 October 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 9-15 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 16-20 is/are rejected.
- 7) ☒ Claim(s) 8 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>10-24-03</u> . | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

This Office action is in response to application papers filed on 24 October 2003.

### **DETAILED ACTION**

#### ***Election/Restrictions***

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 1-8, 16-20 are drawn to a method of forming a gas dielectric support structure, classified in class 438, subclass 619.
  - II. Claims 9-15 are drawn to a semiconductor gas dielectric support structure, classified in class 257, subclass 776.
2. The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product as claimed can be made by another

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and materially different process such as by using conductive material to define the gas dielectric area instead of the as-claimed wiring-layer dielectric.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with Spencer K. Warnick on 18 August 2004 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-8, 16-20. Affirmation of this election must be made by applicant in replying to this Office action. Claims 9-15 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

5. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-7, 16-20 are rejected under 35 U.S.C. 102(b) as being anticipated by Clevenger et al. (US 2001/0014526 A1).

Referring to Figs. 5-8 and paragraphs [0035] to [0042], Clevenger et al. disclose a method of forming a gas dielectric interconnect structure that includes the following features:

- An upper level of wiring lines (13) is formed in a sacrificial dielectric medium as shown in Fig. 6;
- A hard mask (15) is formed between adjacent wiring lines (13) and is coplanar with the top surface of the wiring lines (13);
- Exemplary hard mask (15) materials are dielectrics like silicon oxide or silicon nitride;
- An upper level of vias (12) is formed below the upper level of wiring lines (13) and is also formed in the sacrificial dielectric medium as shown in Fig. 6;

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- The vias (12) and wiring lines (13) are sequentially formed over a semiconductor substrate (0) with semiconductor devices formed thereon;
- The vias (12) and wiring lines (13) are formed by patterning the sacrificial dielectric medium to form openings and filling the openings with conductor;
- The sacrificial dielectric medium is completely removed to form an air dielectric as shown in Fig. 8;
- Also shown in Fig. 8, portions of the hard mask (15) remain as a bridge formed between adjacent wiring lines (13); and
- Also shown in Fig. 8, the bottom surfaces of the wiring lines are surrounded by air.

These are all of the limitations set forth in claims 1-7, 16-20 of the applicant's invention.

### ***Allowable Subject Matter***

8. Claim 8 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form to include all of the limitations of the base claim and any intervening claims.

9. The following is a statement of reasons for the indication of allowable subject matter: Claim 8 would be allowable because the prior art of record does not teach or suggest, in combination with the other claim limitations, a method of forming a gas

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dielectric with support structure that includes the step of forming a vertical sacrificial spacer in a selectively removed portion of a wiring-level dielectric prior to the step of forming a conductive structure in the selectively removed portion.

### ***Conclusion***

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Anand et al., Kloster et al., and Park et al. teach air dielectric interconnect structures that feature a coplanar bridge between two adjacent wiring lines.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen W. Smoot whose telephone number is 571-272-1698. The examiner can normally be reached on M-F (8:00 am to 4:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SWS

*Stephen W. Smoot*  
Patent Examiner  
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